

CLAIMS

1. A method of detecting microorganisms in a sample by means of a nucleic acid probe comprising the following steps:
 - a) fixing the microorganisms contained in the sample;
 - b) incubating the fixed microorganisms with the detectable nucleic acid probe molecules;
 - c) removing nonhybridized nucleic acid probe molecules;
 - d) separating the hybridized nucleic acid probe molecules without using formamide and
 - e) detecting the separated nucleic acid probe molecules.
2. A method according to Claim 1, wherein the separated nucleic acid probe molecules in step e) are also quantified.
3. A method according to Claim 1 or 2, wherein the separation solution used in step d) is selected from the group consisting of water, buffered water, DMSO and SSC.
4. A method according to Claim 3, wherein the separation solution is 0.001 - 1.0 M Tris/HCl, pH 9.0 +/- 2.0.
5. A method according to Claim 3 or 4, wherein the separation solution is 0.01 M Tris/HCl, pH 9.0 +/- 2.0.

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6. A method according to one of the preceding claims, wherein step d) is carried out at a temperature of 50 to 100 °C.
7. A method according to one of the preceding claims, wherein step d) is carried out at a temperature lower than 100 °C.
8. A method according to one of the preceding claims, wherein step d) is carried out at a temperature of approximately 80 °C.
9. A method according to one of the preceding claims, wherein the nucleic acid probe is complementary to a chromosomal or episomal DNA, an mRNA or rRNA of a microorganism to be detected.
10. A method according to one of the preceding claims, wherein the nucleic acid probe is covalently bonded to a detectable marker.
11. A method according to Claim 10, wherein the detectable marker is selected from the group of the following markers:
 - a) fluorescence markers,
 - b) chemoluminescence markers,
 - c) radioactive markers,
 - d) enzymatically active group,
 - e) haptene,
 - f) nucleic acid detectable by hybridization.
12. A method according to one of the preceding claims, wherein the microorganism is a single-cell microorganism.

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13. A method according to one of the preceding claims, wherein the microorganism is a yeast, a bacterium, an alga or a fungus.
14. A method according to Claim 13, wherein the microorganism belongs to the genus *Salmonella*.
15. A method according to one of the preceding claims, wherein the sample is an environmental sample taken from water, soil or air.
16. A method according to one of Claims 1 through 14, wherein the sample is a food sample.
17. A method according to Claim 16, wherein the sample is taken from milk or milk products, drinking water, beverage, baked products or meat products.
18. A method according to one of Claims 1 through 14, wherein the sample is a medicinal sample.
19. A method according to Claim 18, wherein the sample is taken from tissue, secretions or fecal matter.
20. A method according to one of Claims 1 through 14, wherein the sample is taken from wastewater.
21. A method according to Claim 20, wherein the sample is taken from activated sludge, putrefactive sludge or anaerobic sludge.
22. A method according to one of Claims 1 through 14, wherein the sample is taken from a biofilm.
23. A method according to Claim 22, wherein the biofilm is taken from an industrial plant, is formed in

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purification of wastewater or is a naturally occurring biofilm.

24. A method according to one of Claims 1 through 14, wherein the sample is taken from a pharmaceutical or cosmetic product.
25. A kit for carrying out the method according to one of the preceding claims, containing
- a) at least hybridization buffer,
 - b) at least one nucleic acid probe,
 - b1) for specific detection of a microorganism,
 - b2) for performing a negative control.
26. A kit according to Claim 25, containing at least one specific probe for detection of bacteria of the genus *Salmonella*.
27. A kit according to Claim 26, containing the nucleic acid probes

Salm63: 5'-TCGACTGACTTCAGCTCC-3'

and

NonSalm: 5'-GCTAACTACTTCTGGAGC-3'

or a nucleic acid probe that differs from Salm 63 and/or NonSalm by a deletion and/or an addition, whereby the ability of this probe to hybridize with *Salmonella*-specific nucleic acid is maintained, or a nucleic acid that can hybridize with the aforementioned nucleic acids.

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